



Clock Configuration for Cisco 1751/1760 Routers

This document provides information for configuring clocking on the Cisco 1751 and 1760 routers. There are two methods for configuring clocking.

The first method is for data only configurations. This method is used when the router is executing data only images of the Cisco IOS software. These are images which do not support voice applications (the image names do not have a “v” in them). This method applies to the following Voice/WAN Interface Cards (VWICs).

- VWIC-1MFT-T1
- VWIC-2MFT-T1
- VWIC-1MFT-E1
- VWIC-2MFT-E1
- VWIC-2MFT-T1-DI
- VWIC-2MFT-E1-DI
- VWIC-1MFT-G703
- VWIC-2MFT-G703
- VWIC2-1MFT-T1/E1
- VWIC2-2MFT-T1/E1
- VWIC2-1MFT-G703
- VWIC2-2MFT-G703

The second method is for voice-supporting images (those images that do have a “v” in their image names). For these images, this document provides information for configuring the time-division multiplexing (TDM) clock on interface cards that supply a TDM clock, specifically the following:

- VIC-2BRI-NT/TE
- WIC-1ADSL
- WIC-1SHDSL
- VWIC-1MFT-T1
- VWIC-2MFT-T1
- VWIC-1MFT-E1

- VWIC-2MFT-E1
- VWIC-2MFT-T1-DI
- VWIC-2MFT-E1-DI
- VWIC-1MFT-G703
- VWIC-2MFT-G703
- VWIC2-1MFT-T1/E1
- VWIC2-2MFT-T1/E1
- VWIC2-1MFT-G703
- VWIC2-2MFT-G703
- VIC2-1MFT-T1/E1
- VIC2-2MFT-T1/E1



Note

The remaining Voice Interface Cards (VICs) and WAN interface cards (WICs) available from Cisco do not provide TDM clocking and are referred as “Other” in the “Clock Configuration for Voice Images” section.



Note

For all the cards listed for both clocking methods, you must set the clocking and know the source of the clock. Only one clock source can be used to provide clocking for the router. If the clock is not configured, the port will not communicate with the network.

Clock Configuration for Data Only Images

The Cisco 1- and 2-port T1/E1 multiflex interface cards support generic single- or dual-port T1 or E1 trunk interfaces for voice, data, and integrated voice/data applications. These cards provide basic structured T1 service, as well as structured and unstructured E1 services, and can be used as trunk interfaces for data services only, such as fractional $n \times 64$ Kbps service for WANs.

clock source Command

The **clock source** command specifies the clock source for transmitted data for the T1 or E1 VWIC.

The command is used when the router has been put into the controller configuration mode for T1 or E1 for a specified port on the VWIC.

The syntax of the command is as follows:

```
clock source {line[primary] | internal} [independent]
```

The **line** keyword (the default setting) specifies that the clock source is derived from the active line. The **internal** keyword specifies the free-running internal clock.

These rules apply to clock sourcing:

- When both ports are set to **line** with no primary specification, port 0 is the default primary clock source and port 1 is the default secondary clock source.

- When both ports are set to **line** and one port is set as the primary clock source, the other port is by default the backup or secondary source and is loop-timed.
- If one port is set to **line** or to **line primary** and the other port is set to **internal**, the internal port recovers the clock from the line port if the line port is up. If it is down, then the internal port generates its own clock.
- If both ports are set to **internal**, there is only one clock source—internal.
- The **independent** keyword expands on the **clock source internal** and **clock source line** to specify that the port can operate on an independent clocking domain (NMSI mode). Currently, on a 2-port VWIC-MFT, if both ports are configured as **clock source line**, the 2-port is really looped, which means that it's getting the clock from the first port. With NMSI mode, this dependency no longer exists, so the keyword **independent** means that both ports can be independently clocked.



Note When NMSI mode is configured, the controller will support only one channel-group.

T1/E1 Data Configuration

Follow these steps to configure your digital T1/E1 voice WAN interface card (VWIC) for WAN data traffic.

	Command	Purpose
Step 1	Router# configure terminal	Enters global configuration mode. Skip this step if you are already in terminal configuration mode.
Step 2	Router(config)# card type {t1 e1} subslot	<p>Sets or changes the card type to support either T1 (t1) or E1 (e1) circuits.</p> <ul style="list-style-type: none"> • <i>subslot</i> Specifies the VWIC slot number. Range can be 0 to 3, depending on host module or platform. • When the command is used for the first time, the configuration takes effect immediately. • A subsequent change in the card type will not take effect unless you enter the reload command or reboot the router.
Step 3	Router(config)# controller {T1 E1} port	Enters controller configuration mode for T1 or E1 controller at the <i>port</i> location specified. Skip this step if you are already in controller configuration mode.
Step 4	Router(config-controller)# framing {esf sf} or Router(config-controller)# framing {crc4 no-crc4}	<p>Specifies the framing type designated by your service provider. Extended Superframe (ESF) and Super Frame (SF) are for T1 circuits, whereas cyclic redundancy check 4 (CRC4) and NO-CRC4 are for E1 circuits.</p> <p>The default setting for T1 framing is <i>esf</i>. The default setting for E1 framing is <i>crc4</i>.</p>

Command	Purpose
<p>Step 5 Router(config-controller)# clock source {line [primary hits] internal} [independent]</p>	<p>Specifies the clock source:</p> <ul style="list-style-type: none"> • When both ports are set to line clocking with no primary specification, port 0 is the default primary clock source and port 1 is the default secondary clock source. <ul style="list-style-type: none"> – When both ports are set to line and one port is set as the primary clock source, the other port is by default the backup or secondary source and is loop-timed. – If one port is set to clock source line and the other is set to clock source internal, the internal port recovers clock from the clock source line port if the clock source line port is up. If it is down, then the internal port generates its own clock. – If both ports are set to clock source internal, there is only one clock source—internal. – The optional keywords primary and bits have no effect on this feature. • NMSI Mode: <ul style="list-style-type: none"> – The independent keyword expands on the clock source internal and clock source line to specify that the port can operate on an independent clocking domain. Currently, on a 2-port VWIC-MFT, if both ports are configured as clock source line, the 2-port is really looped, which means that it's getting the clock from the first port. With NMSI mode, this dependency no longer exists, so the keyword independent means that both ports can be independently clocked. <p>Note When NMSI mode is configured, the controller will support only one channel-group. If you try to configure more than one channel-group, the following error message will occur:</p> <pre>router(config-controller)#channel-group 2 timeslots 3 %Channel-group already created. %Only 1 channel-group can be configured with independent clocking. %Insufficient resources to create channel group</pre> <p>When configuring between clock source independent and no clock source independent, the channel-group has to be removed.</p>

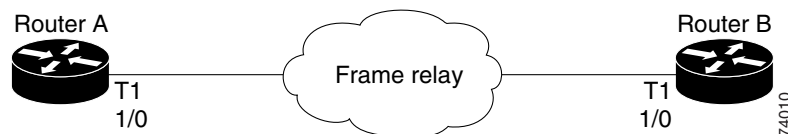
	Command	Purpose
Step 6	Router(config-controller)# linecode {ami b8zs} or Router(config-controller)# linecode hdb3	Specifies the line code type designated by your service provider. The default setting for the T1 line code is binary 8 zero substitution (b8zs). Alternate mark inversion is used on older T1 circuits. High density binary 3 (HDB3) is used on E1 circuits.
Step 7	Router(config-controller)# channel-group <i>channel-group-no</i> timeslots <i>timeslot-list</i>	Enter this command to set up channel groups for WAN data services. The <i>channel-group-no</i> parameter is a value from 0 to 1 for T1/E1 data configuration. The <i>timeslot-list</i> parameter can be a single number, numbers separated by commas, or a pair of numbers separated by a hyphen to indicate a range of time slots. The valid range is from 1 to 24 for T1. For E1, the range is from 1 to 31.
Step 8	Router(config-controller)# no shutdown	Activates the controller.
Step 9	Router(config-controller)# exit	Exits configuration mode.
Step 10	Router(config)# interface serial <i>port:channel-group-no</i>	Enters interface configuration mode for a serial interface that you specify by port. The <i>channel-group-no</i> portion of the command is required only for channelized T1 or E1 interfaces.
Step 11	Router(config-if)# encapsulation {atm-dxi frame-relay hdlc lapb ppp smds x25}	Configures synchronous serial encapsulation. The default encapsulation is hdlc.
Step 12	Router(config-if)# ip address <i>ip-address</i> <i>mask</i>	Assigns the IP address and subnet mask to the interface.
Step 13	Router(config-if)# end	Exits interface configuration mode.

T1/E1 Data Configuration Examples

This section shows an example of clocking for a digital T1/E1 VWIC configured for Frame Relay to send WAN data traffic.

Figure 1 shows a diagram for the configuration example.

Figure 1 Configuration Example for T1/E1 WAN



T1 Configuration Example

This section shows a clocking configuration example for T1 for Router A, a Cisco 1751 router. (See [Figure 1.](#))

```
card type t1 0
controller T1 1/0
    framing esf
    clock source internal
    linecode b8zs
    channel-group 0 timeslots 1-24
!
```

This section shows the corresponding T1 clocking configuration for Router B, a Cisco 3600 series router. (See [Figure 1.](#))

```
controller T1 1/0
    framing esf
    linecode b8zs
    channel-group 0 timeslots 1-24 speed 64
!
```

E1 Configuration Example

This section shows a clocking configuration example for E1 for Router A, a Cisco 1751 router. (See [Figure 1.](#))

```
card type e1 0
controller E1 1/0
    framing crc4
    clock source internal
    linecode hdb3
    channel-group 0 timeslots 1-31
!
```

This section shows the corresponding E1 clocking configuration for Router B, a Cisco 3600 series router. (See [Figure 1.](#))

```
controller E1 1/0
    framing crc4
    linecode hdb3
    channel-group 0 timeslots 1-31
!
```

Verifying Controller Settings

The **show controller t1/e1** command displays the status of T1 or E1 controllers, clock sources, and other settings for the ports. See the following examples for a T1 controller and an E1 controller, respectively.

```
Router#show controller t1 1/0
T1 1/0 is up.
  Applique type is Channelized T1
  Cablelength is long gain36 0db
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20011109, FPGA: 15
  Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
  Data in current interval (130 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

```

Router#show controller e1 1/0
E1 1/0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20011109, FPGA: 15
  Framing is CRC4, Line Code is HDB3, Clock Source is Internal.
  Data in current interval (17 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs

```

Clock Configuration for Voice Images

On a Cisco 1751 router, a maximum of two T1/E1 voice WAN interface card (VWIC) ports can be used for data, and a maximum of two T1/E1 VWIC ports can be used for voice. If the router has one WIC, only one T1/E1 VWIC port can be used for data. If the router has one or two VICs, only one T1/E1 VWIC port can be used for voice.

On a Cisco 1760 router, a maximum of two T1/E1 VWIC ports can be used for data, and a maximum of four T1/E1 VWIC ports can be used for voice. If the router has one WIC, only one T1/E1 VWIC port can be used for data. If the router has one or two VICs, only three T1/E1 VWIC ports can be used for voice. If the router has three VICs, only two T1/E1 VWIC ports can be used for voice.



Note

If a G.SHDSL WIC is configured for central office (CO) mode, it cannot export TDM clocking.

clock source Command

The **clock source** command specifies the clock source for transmitted data for the T1 or E1 VWIC.

The command is used when the router has been put into the controller configuration mode for T1 or E1 for a specified port on the VWIC.

The syntax of the command is as follows:

```
clock source {line [primary | bits] | internal} [independent]
```

The **line** keyword (the default setting) specifies that the clock source is derived from the active line. The **internal** keyword specifies the free-running internal clock.

These rules apply to clock sourcing:

- When both ports are set to **line** with no primary specification, port 0 is the default primary clock source and port 1 is the default secondary clock source.
- When both ports are set to **line** and one port is set as the primary clock source, the other port is by default the backup or secondary source and is loop-timed.
- If one port is set to **line** or to **line primary** and the other port is set to **internal**, the internal port recovers the clock from the line port if the line port is up. If it is down, then the internal port generates its own clock.
- If both ports are set to **internal**, there is only one clock source—internal.

- The **independent** keyword expands on the **clock source internal** and **clock source line** to specify that the port can operate on an independent clocking domain (NMSI mode). Currently, on a 2-port VWIC-MFT, if both ports are configured as **clock source line**, the 2-port is really looped, which means that it's getting the clock from the first port. With NMSI mode, this dependency no longer exists, so the keyword **independent** means that both ports can be independently clocked.



Note When NMSI mode is configured, the controller will support only one channel-group.

tdm clock Configuration

The following conditions must be met before configuring TDM clock:

- BRI interfaces should be shut down before using the **no tdm clock** command for BRI.
- The configuration for a ds0/pri/channel/tdm group on a T1/E1 must be removed before deleting the TDM clock configuration for T1/E1.
- Any residual or default TDM clock configuration must be deleted before creating a new TDM clock configuration.
- If an export port is configured, the line protocol must be up before configuring any import ports.
- On a Cisco 1751 or Cisco 1760 router, if one port is configured as export, all other ports must be configured as imports.
- An export port clock can be turned off only after all the import ports (including BRI-auto ports) are turned off.
- The configured TDM clock and the status of the running TDM clock might be different, depending on the line conditions and connections.

tdm clock Command

The **tdm clock** global configuration command configures the clock source for the T1 VWIC, E1 VWIC, BRI VIC, ADSL, and G.SHDSL WICs. The complete syntax for various clock scenarios is shown in this section.

Exporting Clock

The following shows the command for exporting the clock.

```
tdm clock {T1 | E1} <slot/port> {voice | data | both} export line
tdm clock {atm | bri} <slot/port> export
```

Importing Clock

The following shows the command for importing the clock.

```
tdm clock {T1 | E1} <slot/port> {voice | data | both} import {T1 | E1 | atm | bri |
onboard} <slot/port> {line | internal}

tdm clock {atm | bri} <slot/port> import {T1 | E1 | atm | bri | onboard} <slot/port>
```

TDM Clock Auto Selection for BRI

The following command sets the TDM clock auto selection for BRI only.

```
tdm clock bri-auto
```

Parameter Definitions

This section identifies the **tdm clock** command parameters.

T1	For use with the VWIC-1MFT-T1, VWIC-2MFT-T1, or VWIC-2MFT-T1-DI card.
E1	For use with the VWIC-1MFT-E1, VWIC-2MFT-E1, VWIC-2MFT-E1-DI, VWIC-1MFT-G703, or VWIC-2MFT-G703 card.
atm	For use with the WIC-1ADSL or WIC-1SHDSL card.
bri	For use with the VIC-2BRI-NT/TE card
export	The TDM clock is provided by the line (PSTN or PBX) to which this port is connected.
import	The TDM clock is provided by the onboard clock or the line clock of the export port.
voice	The interface is used exclusively for voice.
data	The interface is used exclusively for data.
both	The interface is used for both data and voice. Note If the T1/E1 port is used for PRI, payload_type must be specified as both .
line	The external line clock is used to move the packet from system to memory, and to move the packet from interface to network.
internal	The onboard system clock is used to move the packet from the interface to the network.

T1/E1 Multiflex Module

The following example shows how to use the internal onboard system clock as the source.

```
Router(config) # tdm clock T1 0/0 both import onboard internal
```

The following example shows how to use the external clock, provided by the network, as the source.

```
Router(config) # tdm clock T1 0/0 both export line
Router(config) # tdm clock T1 0/1 both import T1 0/0 internal
```

ADSL and SHDSL Module

The following example shows how to use the internal onboard system clock as the source.

```
Router(config) # tdm clock atm 1/0 import onboard
```

The following example shows how to use the external clock as the source.

```
Router(config) # tdm clock atm 1/0 export
```

BRI NT/TE Module

The following example shows how to use the internal onboard system clock as the source.

```
Router(config) # tdm clock bri 0/0 import onboard
```

The following example shows how to use the external clock as the source.

```
Router(config) # tdm clock bri 0/0 export
```

Port Clocking Priority

If the configured export port is down, one of the import ports becomes an export port. The priority by which an import port becomes export port is as follows:

1. T1/E1 ports (T1/E1 import ports with the option **line**)
2. BRI ports in TE mode.
3. G.SHDSL ports in CPE mode.
4. ADSL ports.



Note

BRI ports in NT mode, and G.SHDSL ports in CO mode cannot become export ports.

no tdm clock Command

The **no** option for the **tdm clock** command turns off the TDM clock for the port. For example:

```
Router(config)# no tdm clock bri 3/1 import bri 3/0
Router(config)# no tdm clock bri 3/0 export
```

Or

```
Router(config)# no tdm clock atm 0/0 import T1 0/0
Router(config)# no tdm clock T1 0/1 both import T1 0/0 internal
Router(config)# no tdm clock T1 0/0 voice export line
```

show tdm clock Command

The **show tdm clock** command displays the real-time TDM clock status; for example:

```
Router# show tdm clock
Port      Payload State  TDM-Clock-type
1/0       N/A     up      Export
2/0       N/A     up      Import 1/0
2/1       N/A     up      Import 1/0

Tdm-Clock Sourced      Feed          Back-Up
0          1/0           2/0,2/1
```

The **show running-config** command displays the configured TDM clock.

tdm clock bri-auto Command

The **tdm clock bri-auto** command selects the clock source for BRI ports automatically.

```
Router(config)# tdm clock bri-auto
```

This command cannot coexist with a **tdm clock bri import | export** command. If **tdm clock bri-auto** is configured, the lowest BRI slot/port in TE mode is selected as the export port, and all the other BRI ports are configured as import ports for this BRI port.

TDM Clock Default and Status

Table 1 shows the power-up default configuration of the TDM clock values for the Cisco 1751 router and Table 2 shows the power-up default configuration of the TDM clock values for the Cisco 1760 router. The status of the running TDM clock can be obtained by using the **show tdm clock** command.

Table 1 Power-Up Default TDM Clock Values for the Cisco 1751 Router

Slot 0	Slot 1	Slot 2 (VIC Only)	Power-Up Default TDM Clock Values
2MFT-T1/E1	None	None	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 both import T1/E1 0/0 internal
2MFT-T1/E1	1MFT-T1/E1	None	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 both import T1/E1 0/0 internal
2MFT-T1/E1	Other/xDSL	None	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 voice import T1/E1 0/0 internal
1MFT-T1/E1	Other/xDSL	Other	TDM clock T1/E1 0/0 both export line
1MFT-T1/E1	2MFT-T1/E1	None	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 1/0 both import T1/E1 0/0 internal
2MFT-T1/E1	BRI-NT/TE	None	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 data import T1/E1 0/0 internal TDM clock BRI-auto
1MFT-T1/E1	Other/xDSL	BRI-NT/TE	TDM clock T1/E1 0/0 both export line TDM clock BRI-auto

Table 2 Power-Up Default TDM Clock Values for the Cisco 1760 Router

Slot 0	Slot 1	Slot 2 (VIC Only)	Slot 3 (VIC Only)	Power-Up Default TDM Clock Values
2MFT-T1/E1	Other (VIC)	Other	Other	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 both import T1/E1 0/0 internal
2MFT-T1/E1	1MFT-T1/E1	Other	Other	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 both import T1/E1 0/0 internal
1MFT-T1/E1	2MFT-T1/E1	Other	Other	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 1/0 both import T1/E1 0/0 internal
2MFT-T1/E1	Other (WIC)/xDSL	Other	Other	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 voice import T1/E1 0/0 internal
2MFT-T1/E1	2MFT-T1/E1	Other	Other	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 both import T1/E1 0/0 internal
2MFT-T1/E1	2MFT-T1/E1	BRI-NT/TE	Other	TDM clock T1/E1 0/0 both export line TDM clock T1/E1 0/1 both import T1/E1 0/0 internal TDM clock BRI-auto
Other (WIC)/xDSL	2MFT-T1/E1	Other	BRI-NT/TE	TDM clock T1/E1 1/0 both export line TDM clock T1/E1 1/1 voice import T1/E1 1/0 internal TDM clock BRI-auto

TDM Clocking Scenarios

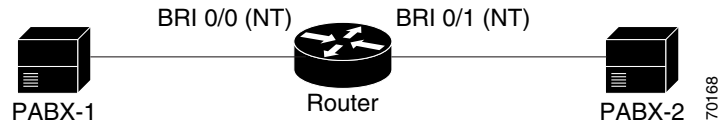
This section describes the timing scenarios that can occur when different combinations of WICs, VICs, and VWICs are used in the slots of the router.

TDM Clocking with a BRI VIC Present

The examples in this section show clocking for a router with a BRI VIC present in slot 0. The remaining slots might have other interface cards.

The following configuration sets up the clocking method shown in [Figure 2](#).

```
Router (config)# tdm clock bri-auto
```

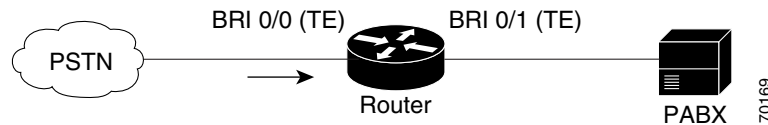
Figure 2 *None of the Ports Receives the Clock*

The following configuration sets up the clocking method shown in [Figure 3](#).

```
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock bri 0/0 export
Router(config)# tdm clock bri 0/1 import bri 0/0
```

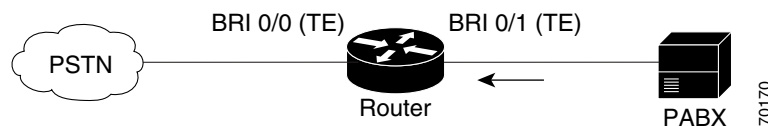
Figure 3 *Port 0/0 Receives the Clock*

The following configuration sets up the clocking method shown in [Figure 4](#).

```
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock bri 0/1 export
Router(config)# tdm clock bri 0/0 import bri 0/1
```

Figure 4 *Port 0/1 Receives the Clock*

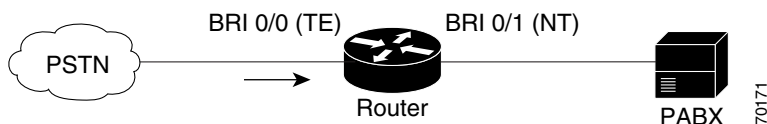
The following configuration sets up the clocking method shown in [Figure 5](#).

```
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock bri 0/0 export
Router(config)# tdm clock bri 0/1 import bri 0/0
```

Figure 5 Only the TE Port Receives the Clock



TDM Clocking with a BRI VIC and a T1/E1 VWIC Present

The examples in this section show clocking for routers with a BRI VIC and a T1/E1 VWIC present. Slot 0 has a T1/E1 card. Slot 1 has a BRI card. The remaining slots might have other cards that do not require TDM clocking.

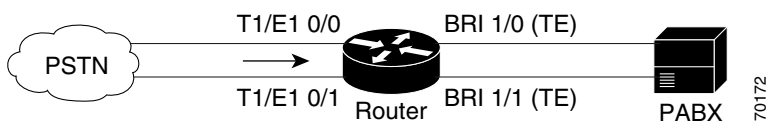
The following configuration sets up the clocking method shown in [Figure 6](#).

```
Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 both import E1 0/0 line
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 both import E1 0/0 line
Router(config)# tdm clock bri 1/0 import E1 0/0
Router(config)# tdm clock bri 1/1 import E1 0/0
```

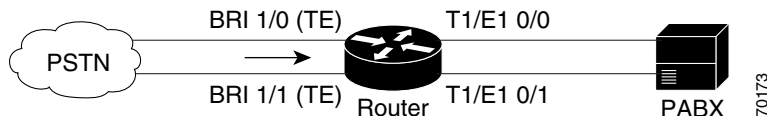
Figure 6 T1/E1 Ports Receive the Clock



The following configuration sets up the clocking method shown in [Figure 7](#).

```
Router(config)# tdm clock bri 1/0 export
Router(config)# tdm clock bri 1/1 import bri 1/0
Router(config)# tdm clock E1 0/0 both import bri 1/0 internal
Router(config)# tdm clock E1 0/1 both import bri 1/0 internal
```

Figure 7 BRI Ports Receive the Clock



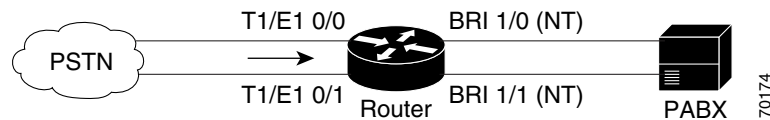
The following configuration sets up the clocking method shown in [Figure 8](#).

```
Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 both import E1 0/0 line
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 both import E1 0/0 line
Router(config)# tdm clock bri 1/0 import E1 0/0
Router(config)# tdm clock bri 1/1 import E1 0/0
```

Figure 8 T1/E1 Ports Receive the Clock



TDM Clocking with a BRI VIC and a xDSL WIC Present

The examples in this section show clocking for routers with a BRI VIC and xDSL WIC present. The following parameters apply:

- Slot 0 has a BRI card.
- Slot 1 has an xDSL card.
- The remaining slots have interface cards that do not require TDM clocking.

The following configuration sets up the clocking method shown in [Figure 9](#).

```
Router(config)# tdm clock bri-auto
```

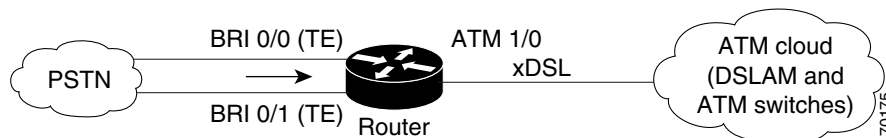
Or

```
Router(config)# tdm clock bri 0/0 export
Router(config)# tdm clock bri 0/1 import bri 0/0
```

Or

```
Router(config)# tdm clock bri 0/0 export
Router(config)# tdm clock bri 0/1 import bri 0/0
Router(config)# tdm clock atm 1/0 import bri 0/0
```

Figure 9 BRI Ports Receive the Clock



The following configuration sets up the clocking method shown in [Figure 10](#).

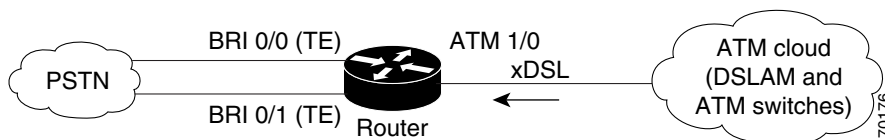
```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock bri 0/0 import atm 1/0
```

```
Router(config)# tdm clock bri 0/1 import atm 1/0
```

Or

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock bri-auto
```

Figure 10 DSL Port Receives the Clock



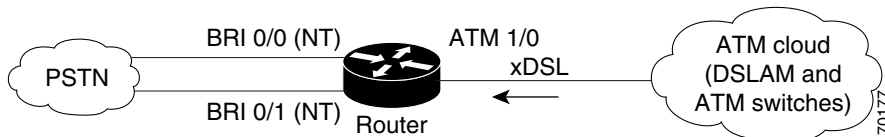
The following configuration sets up the clocking method shown in [Figure 11](#).

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock bri 0/0 import atm 1/0
Router(config)# tdm clock bri 0/1 import atm 1/0
```

Or

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock bri-auto
```

Figure 11 Only the DSL Port Can Receive the Clock



The following configuration sets up the clocking method shown in [Figure 12](#).

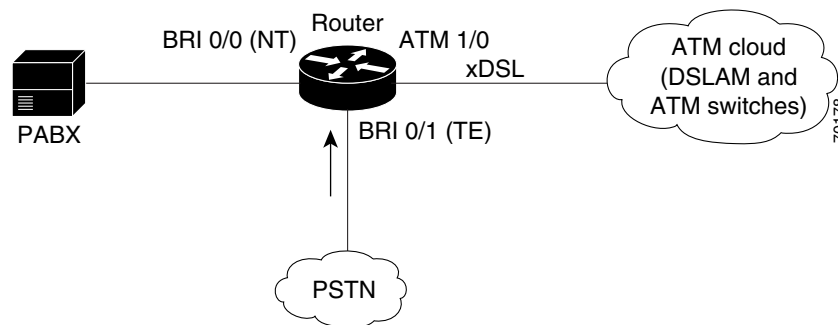
```
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock bri 0/1 export
Router(config)# tdm clock bri 0/0 import bri 0/1
```

Or

```
Router(config)# tdm clock bri 0/1 export
Router(config)# tdm clock bri 0/0 import bri 0/1
Router(config)# tdm clock atm 1/0 import bri 0/1
```

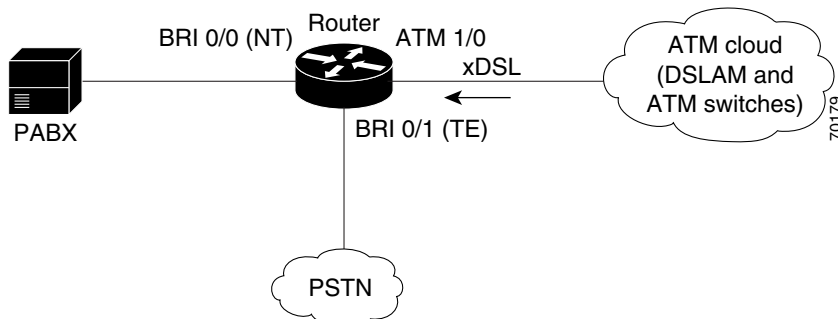
Figure 12 Only BRI TE Can Receive the Clock

The following configuration sets up the clocking method shown in [Figure 13](#).

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock bri 0/0 import atm 1/0
Router(config)# tdm clock bri 0/1 import atm 1/0
```

Or

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock bri-auto
```

Figure 13 DSL Port Receives the Clock

TDM Clocking with a T1/E1 VWIC and a xDSL WIC Present

The examples in this section show clocking for routers with a T1/E1 VWIC and xDSL WIC present. The following parameters apply:

- Slot 0 has a T1/E1 card.
- Slot 1 has an xDSL card.
- Slot 2 and slot 3 (Cisco 1760 router) are empty or have cards that do not require TDM clocking.

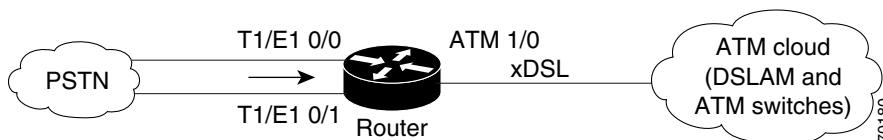
The following configuration sets up the clocking method shown in [Figure 14](#).

```
Router(config)# tdm clock T1 0/0 both export line
Router(config)# tdm clock T1 0/1 voice import T1 0/0 line
```

Or

```
Router(config)# tdm clock T1 0/0 both export line
Router(config)# tdm clock T1 0/1 voice import T1 0/0 line
Router(config)# tdm clock atm 1/0 import T1 0/0
```

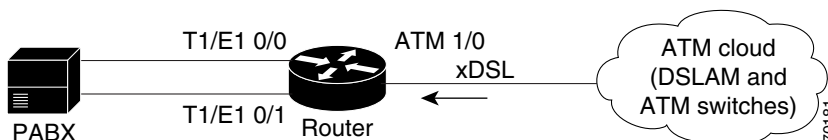
Figure 14 T1/E1 VWIC Ports Receive the Clock



The following configuration sets up the clocking method shown in [Figure 15](#).

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock T1 0/0 both import atm 1/0 internal
Router(config)# tdm clock T1 0/1 voice import atm 1/0 internal
```

Figure 15 DSL Port Receives the Clock



TDM Clocking with a T1/E1 VIC, BRI VIC, and xDSL WIC Present

The examples in this section show clocking for routers with a T1/E1, BRI VIC, and xDSL WIC present. The following parameters apply:

- Slot 0 has a T1/E1 card.
- Slot 1 has an xDSL card.
- Slot 2 has a BRI card.
- Slot 3 (Cisco 1760 router) is empty or has a card that does not require TDM clocking.

The following configuration sets up the clocking method shown in [Figure 16](#).

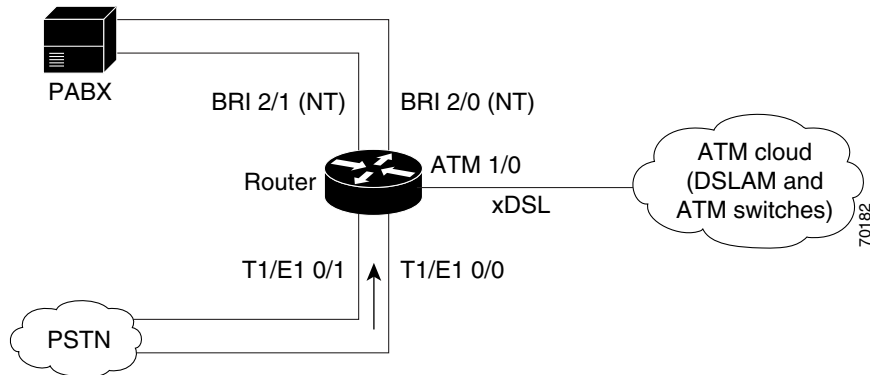
```
Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 voice import E1 0/0 line
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 voice import E1 0/0 line
Router(config)# tdm clock bri 2/0 import E1 0/0
Router(config)# tdm clock bri 2/1 import E1 0/0
```

Or

```
Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 voice import E1 0/0 line
Router(config)# tdm clock bri-auto
Router(config)# tdm clock atm 1/0 import E1 0/0
```

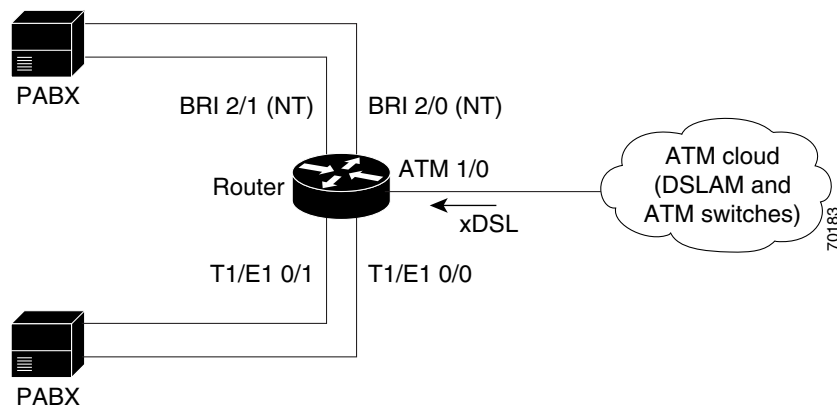
Figure 16 T1/E1 Ports Receive the Clock

The following configuration sets up the clocking method shown in [Figure 17](#).

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock E1 0/0 both import atm 1/0 internal
Router(config)# tdm clock E1 0/1 voice import atm 1/0 internal
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock E1 0/0 both import atm 1/0 internal
Router(config)# tdm clock E1 0/1 voice import atm 1/0 internal
Router(config)# tdm clock bri 2/0 import atm 1/0
Router(config)# tdm clock bri 2/1 import atm 1/0
```

Figure 17 DSL Port Receives the Clock

The following configuration sets up the clocking method shown in [Figure 18](#).

```
Router(config)# tdm clock bri 2/0 export
Router(config)# tdm clock bri 2/1 import bri 2/0
Router(config)# tdm clock E1 0/0 both import bri 2/0 internal
Router(config)# tdm clock E1 0/1 voice import bri 2/0 internal
```

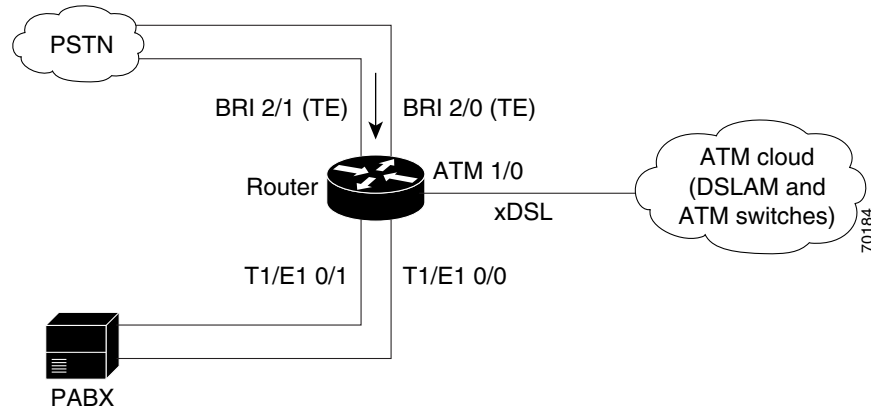
Or

```
Router(config)# tdm clock bri 2/0 export
```

```

Router(config)# tdm clock bri 2/1 import bri 2/0
Router(config)# tdm clock E1 0/0 both import bri 2/0 internal
Router(config)# tdm clock E1 0/1 voice import bri 2/0 internal
Router(config)# tdm clock atm 1/0 import bri 2/0
    
```

Figure 18 BRI TE Ports Receive the Clock



The following configuration sets up the clocking method shown in [Figure 19](#).

```

Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 voice import E1 0/0 line
Router(config)# tdm clock bri-auto
    
```

Or

```

Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 voice import E1 0/0 line
Router(config)# tdm clock bri 2/0 import E1 0/0
Router(config)# tdm clock bri 2/1 import E1 0/0
    
```

Or

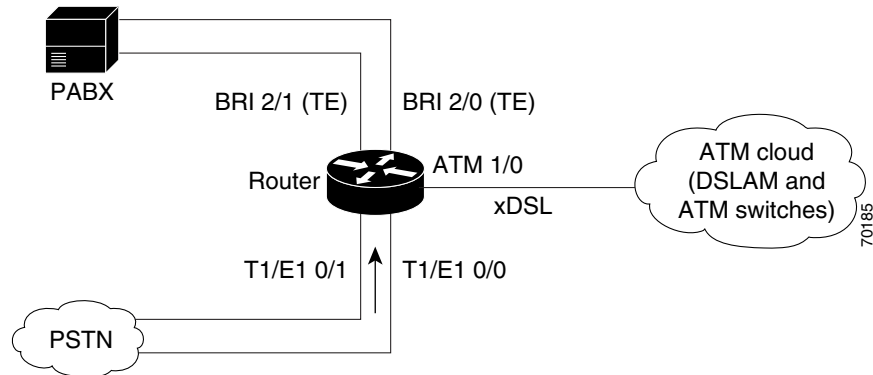
```

Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 voice import E1 0/0 line
Router(config)# tdm clock bri-auto
Router(config)# tdm clock atm 1/0 import E1 0/0
    
```

Or

```

Router(config)# tdm clock E1 0/0 both export line
Router(config)# tdm clock E1 0/1 voice import E1 0/0 line
Router(config)# tdm clock bri 2/0 import E1 0/0
Router(config)# tdm clock bri 2/1 import E1 0/0
Router(config)# tdm clock atm 1/0 import E1 0/0
    
```

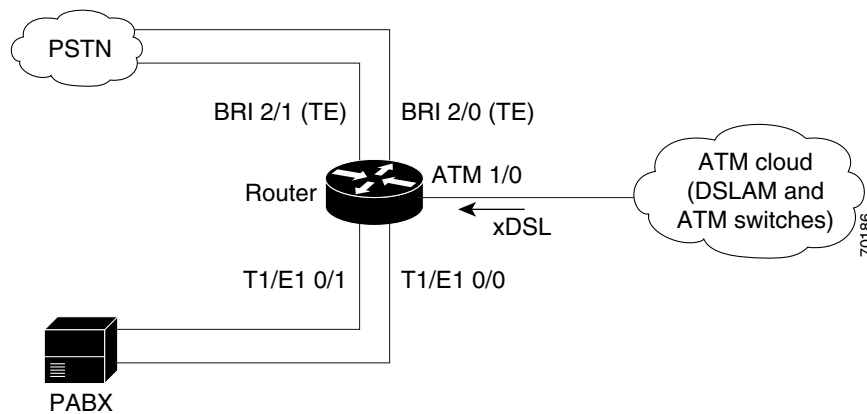
Figure 19 T1/E1 Ports Receive the Clock

The following configuration sets up the clocking method shown in [Figure 20](#).

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock E1 0/0 both import atm 1/0 internal
Router(config)# tdm clock E1 0/1 voice import atm 1/0 internal
Router(config)# tdm clock bri-auto
```

Or

```
Router(config)# tdm clock atm 1/0 export
Router(config)# tdm clock E1 0/0 both import atm 1/0 internal
Router(config)# tdm clock E1 0/1 voice import atm 1/0 internal
Router(config)# tdm clock bri 2/0 import atm 1/0
Router(config)# tdm clock bri 2/1 import atm 1/0
```

Figure 20 DSL Port Receives the Clock

TDM Clocking with a T1/E1 VWIC

The examples in this section describe the timing topologies that can result when slot 0 is a T1/E1 interface and all other slots are empty. Slot 0 is shown in the examples, but the configurations apply to a T1/E1 interface in any slot.

The following configuration sets up the clocking method shown in [Figure 21](#):

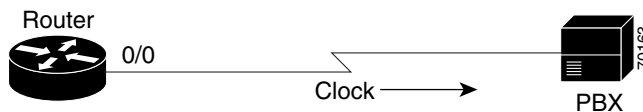
```
Router(config)# tdm clock T1 0/0 voice import onboard
```



Note

Generally this method is useful only when connecting to a PBX, key system, or channel bank. A Cisco voice over IP (VoIP) gateway rarely provides clocking to the CO, because CO clocking provides a higher Stratum level.

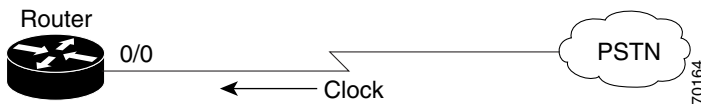
Figure 21 Single T1 Port Providing Clocking



The following configuration sets up the clocking method shown in [Figure 22](#):

```
Router(config)# tdm clock T1 0/0 voice export line
```

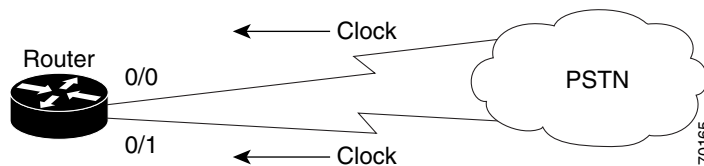
Figure 22 Single T1 Port Receiving Clocking from Line



The following configuration sets up the clocking method shown in [Figure 23](#).

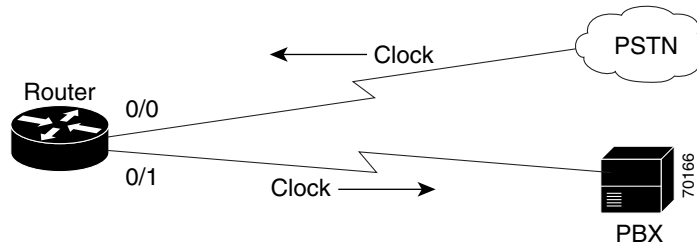
```
Router(config)# tdm clock T1 0/0 voice export line
Router(config)# tdm clock T1 0/1 voice import t1 0/0 line
```

Figure 23 Dual T1 Ports Receiving Line Clocking



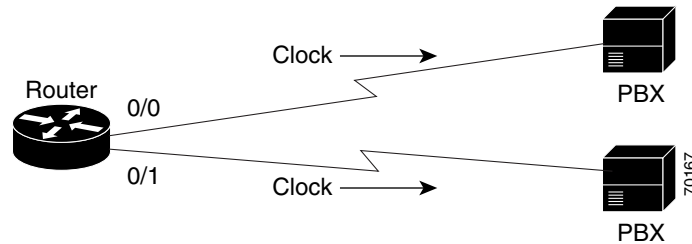
The following configuration sets up the clocking method shown in [Figure 24](#).

```
Router(config)# tdm clock T1 0/0 voice export line
Router(config)# tdm clock T1 0/1 voice import t1 0/0 internal
```

Figure 24 *Dual T1 Ports, One Receiving Clocking and One Providing Clocking*

The following configuration sets up the clocking method shown in [Figure 25](#).

```
Router(config)# tdm clock T1 0/0 voice import onboard internal
Router(config)# tdm clock T1 0/1 voice import onboard internal
```

Figure 25 *Dual T1 Ports, Both Ports Provide Clocking to the Line*

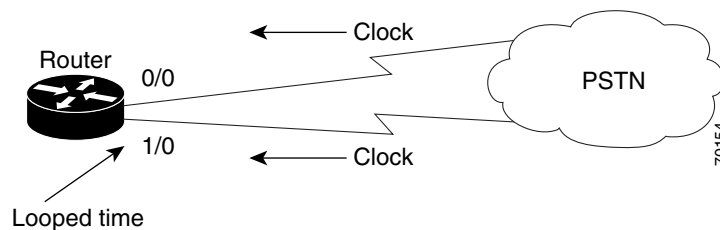
TDM Clocking with Two T1/E1 VVICs

The examples in this section describe the timing topologies that can result when there are T1/E1 interfaces in any two slots. The following parameters apply:

- Slot 0/Port 1 is not used.
- Slot 1/Port 1 is not used.
- In these examples, T1 interfaces are located in slot 0 and slot 1.

The following configuration sets up the clocking method shown in [Figure 26](#).

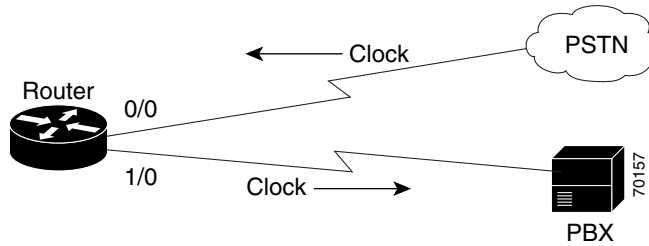
```
Router(config)# tdm clock T1 0/0 voice export line
Router(config)# tdm clock T1 1/0 voice import t1 0/0 line
```

Figure 26 *Dual T1 Ports Receiving Line Clocking*

The following configuration sets up the clocking method shown in [Figure 27](#).

```
Router(config)# tdm clock T1 0/0 voice export line
Router(config)# tdm clock T1 1/0 voice import t1 0/0 internal
```

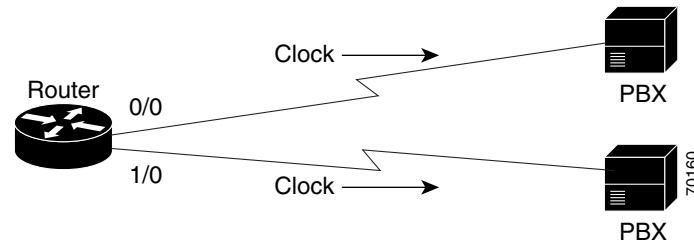
Figure 27 *Dual T1 Ports, One Receiving Clocking and One Providing Clocking*



The following configuration sets up the clocking method shown in [Figure 28](#).

```
Router(config)# tdm clock T1 0/0 voice import onboard
Router(config)# tdm clock T1 1/0 voice import onboard
```

Figure 28 *Dual T1 Ports, Both Ports Providing Clocking to the Line*



Related Documentation

This document provides updated information on Cisco 1- and 2-port T1/E1 multiflex interface cards. This information supplements the *Cisco Interface Cards Hardware Installation Guide*.

Use this document with the following guides:

- *Cisco 1700 Router Hardware Installation Guide*
- *Cisco Interface Cards Hardware Installation Guide*
- *Cisco 1- and 2-port T1/E1 Multiflex Voice/WAN Interface Cards for the Cisco 1751 and Cisco 1760 Routers*
- *Cisco 1- and 2-port T1/E1 Multiflex Voice/WAN Interface Cards for the Cisco 1721 Router*
- *Cisco 1700 Series Router Software Configuration Guide*
- *Voice, Video, and Fax Configuration Guide, Cisco IOS Release 12.2*
- *Voice, Video, and Fax Command Reference, Cisco IOS Release 12.2*
- *Dial Services Configuration Guide: Signaling Configuration, Cisco IOS Release 12.2*
- *Regulatory Compliance and Safety Information for Cisco 1600 and Cisco 1700 Routers*

These documents are available at the following URLs:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/1700/index.htm

<http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/>

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<http://www.cisco.com/go/marketplace/>

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You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpk/pdi.htm

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San Jose, CA 95134-9883

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- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

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<http://www.cisco.com/go/psirt>

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

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- Emergencies—security-alert@cisco.com
- Nonemergencies—psirt@cisco.com



Tip

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one that has the most recent creation date in this public key server list:

<http://pgp.mit.edu:11371/pks/lookup?search=psirt%40cisco.com&op=index&exact=on>

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

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The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year, at this URL:

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Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

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**Note**

Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

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To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

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Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

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- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

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- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

<http://www.cisco.com/ipj>

- World-class networking training is available from Cisco. You can view current offerings at this URL:

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